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ABSTRACT

This document examines support for students in open learning systems (OLS) by clarifying the concept at the theoretical level, looking for empirical support for its potential value, and identifying key variables that constrain approaches to support. Part 1 clarifies two key concepts--support and effects. Part 2 presents the definition of OLS. In Part 3, a structured overview of approaches toward support is presented, resulting in a multidimensional categorization. The demand for or necessity of support facilities is discussed in Part 4. Part 5 introduces the discussion of "functions" of support. Parts 6 and 7 structure the empirical results in relation to the potential benefits of support approaches. First, results are discussed in relation to the OLS. Next, an overview is provided of research results outside the context of OLS that extend the findings presented in Part 6. This two-sided approach to the discussion helps to clarify strengths and shortcomings of support-related research in OLS and implies the integration of the support dimensions, the support functions, and the support effects in terms of study success and persistence. The conclusions in Part 8 lead to a priority list for a research agenda in relation to support in OLS. (Contains 107 references.) (Author/YLB)

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Onderwijstechnologisch innovatie centrum OTIC

Open universiteit

# Functions and effects of support in open learning systems

## *Outlining current empirical findings*

ED 364 670

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U.S. DEPARTMENT OF EDUCATION
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The main objectives are in the field of flexible organisation of support, incorporation of support into the learning materials, optimizing the link between prior knowledge state and the support needs and the development of more flexible (and automated) approaches towards guidance oriented evaluation.

This project is embedded in the larger research domain "Intake, guidance and evaluation". this helps to build on the outcomes and experiences of e.g. the prior knowledge project, projects in relation to automated evaluation, etc. This multi-disciplinary and multi-focus approach is necessary to pursue the wide diversity of the project objectives.

Educational Technology Innovation Centre

Open University

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## Outlining current empirical findings

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# FUNCTIONS AND EFFECTS OF SUPPORT IN OPEN LEARNING SYSTEMS
## Outlining current empirical findings

## 1. Introduction

The provision of "support" in the context of open learning systems is an issue causing heavy debates. The objective of this article is not to answer whether the provision of support facilities is effective or not. Rather, we try to put approaches to "support" in a wider perspective by clarifying the concept at the theoretical level, by looking for empirical support[1] for its - potential - value and by identifying key variables which constrain approaches to support in the context of open learning systems (O.L.Systems).

The title of this article contains three key concepts which have to be clarified beforehand : **"support"** and **"effects"** and **"open learning systems"**.

The term **"support"** is deliberately chosen because other terms represent rather limited ideas about student help provisions. The concept is used to describe a variety of interventions, such as "informing, advising, counselling, coaching, assessment, advocacy and feedback" to sustain the learning activities of students in open learning systems (Paine, 1991, p.334-335). Another vital issue in connection to "support" is that it is not necessarily linked to a person. Support can be mediated through a tutor, a supervisor, an advisor, an 'animateur', a facilitator, a counsellor, a coach, a mentor, etc. but can also be mediated through alternative means such as written course materials, special packages, etc. The second concept **"effects"** refers to a variety of - expected - outcomes of the support activities. The third concept **"open learning systems"** will be dealt with in the second part of this text. In this part, we present our definition of "Open Learning Systems" (O.L.Systems). A clear definition is felt to be necessary to put support in the context of a managable and pragmatic approach towards open learning.

In part three, a structured overview of approaches towards "support" is presented, resulting in a multi-dimensional categorization. The demand for or necessity of support facilities is discussed in the fourth part of this article. This discussion emphasizes the importance of student and course characteristics in implementing support initiatives. Part five introduces the discussion of "functions" of support. In part six and seven, we structure the empirical results in relation to the potential benefits of support-approaches. First the results are discussed in relation to the O.L.Systems, next we give an overview of research results outside the context of O.L.Systems that extend the findings presented in part six. This two-sided approach to the discussion of research results helps to clarify the strengths and shortcomings of support-related research in O.L.Systems. This implies the integration of the support dimensions, the support functions and the support effects in terms of study success and persistence. The conclusions in this final text component help us to present a priority list for a research agenda in relation to support in O.L.Systems.

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[1] This implies that the main body of this text is only based on research findings. Only to a very restricted degree reflective, explorative and practical documents, books and articles have been consulted in relation to the topic of this text.

## 2. Open Learning Systems (O.L.Systems)

When looking for research findings revealing the impact of support in O.L.Systems, a review of the literature is hindered by differences in the implementation of open education programs[2]. Therefore, a more precise description of O.L.Systems is needed beforehand.
We define Open Learning Systems (O.L.Systems) as flexible learning systems which support a learning process in which there is a delicate balance between a maximal student freedom of choices and the optimal adaptation to the characteristics of the learner, in order to guarantee a maximal degree of study success.

In the context of this article a pragmatic and realistic approach to O.L.Systems is adopted. Earlier definitions of O.L.Systems are too vague or too idealistic[3]. A more realistic approach of O.L.Systems tries to reconciliate on the one hand the highest level of freedom for the learner and at the other hand, the requirements and specifications of the educational setting (reflecting societal standards). O.L.Systems imply the tuning of a study programme, a study method, study speed to the prior knowledge state of the individual student (Dochy, 1991); and this in consultation between the student and an advisor. Certain dimensions or degrees of openness seem rather to obstruct than to facilitate the total learning process. A typical example of the latter is "unlimited access" to educational provisions without educational advising.

Table 1 : Criteria for defining Open Learning Systems

| PRIMARY CRITERIA | | | | |
|---|---|---|---|---|
| Category | Criteria | Freedom | Limitations | Result |
| 1. Student | Prior knowledge state | / | | Prior knowledge state |
| 2. Aims | Objectives | Free | Prior knowledge<br>Demands subject matter<br>Study programme<br>Predefined diploma | Set of objectives |
| 3. Learning content | Specific content<br>General content<br>Study route | Acknowledged diploma or no Study program | Diploma: content is prescripted | Own or prescripted objectives |
| SECUNDARY CRITERIA | | | | |
| 4. Study method | Information sources<br>Interaction sources | Relatively free | | Personal study method |
| 5. Evaluation | Frequency<br>Type<br>Format | Free<br>Free<br>/ | Related to the objectives, level<br>Related to type, domain and level | Evaluation plan |
| 6. Learning environment (student) | Circumstances<br>Primary needs (Maslow)<br>Material & social<br>Task environment | Free<br>Free<br>Free<br>Institute | Personal situation | Personal study setting |
| 7. Study environment (institute) | Support :<br>time, speed, place<br>Access | Free<br>Free | Prior knowledge<br>Personal situation | OLS-Institute<br>Study plan |
| 8. Study planning | Time<br>Speed/duration<br>Place | Free<br>Free<br>Free | Objectives<br>Prior knowledge<br>priorities | |

[2] Giaconia & Hedges (1982) encountered the same kind of problems when trying to review key features of effective open education. Their major review of studies that measure both academic achievement and nonachievement outcomes suggests that open education programs are generally not effective in producing both types of outcomes. But Marshall (1981, p.181) suggests - for yielding more meaningful results - to distinguish areas of component dimensions in which openness of education has been implemented and to investigate relationships between the component dimensions and particular outcome variables.

[3] Cf. Carr, 1990; de Wolf, 1990; Marshall, 1981; Paine, 1989; ... .

Also "evaluation" cannot be defined in terms of student wishes or preferences. Students cannot determine the format and/or content of evaluation. Absolute freedom undermines the societal credibility of the study (programme/certificate). But at the other hand, evaluation is to be multi-functional and is its content and format are to be linked to the choice for the specific study aims, content, programme and support provisions.

Optimal O.L.Systems seem to meet the demands in relation to a variety of criteria. These criteria can be subdivided into 8 main categories as represented in table 1.
The three first categories can be described as "primary categories" since they help to define the major set-up and content of the learning process. The "secundary categories" define limitations within certain limits as defined by the choices made in relation to the primary categories. We describe in short these categories in table 1. Subsequently, the interrelations between primary and secondary criteria in O.L.Systems are represented in figure 1.
First of all, O.L.Systems are defined, taking into account particularities of the individual student. Here, the decisive criterion is the actual **prior knowledge state**, as measured and defined by e.g. an objective instrument. These prior knowledge state tests can be developed and provided for by the Open Learning Institute[4]. The prior knowledge state can also be defined, based on subjective speculations on earlier educational and professional experiences.
The next category, entails the definition of the **general aims**. Although the student is free in stating these aims, he has to take into account the limitation as defined by his prior knowledge state, the study-programme definition and the demands of the **learning content**. A set of defined learning obectives is the basis for selecting the learning content. This choice is influenced by considerations about the final diploma type pursued : a pre-defined diploma programme or a set of unrelated modules. The latter choice does not presuppose content choices in terms of a prescribed programme-route. The former choice is completely limited by the delineated programme objectives, content and study route.
Defining the prior knowledge state, the learning objectives and the learning content determines to a certain extent the degree of freedom in relation to the secondary criteria (Figure 1).
The **study method** is free, but here information sources and interaction sources are influenced by the objectives and learning materials. **Evaluation** does in large depend on the learning objectives and the study domain. Evaluation frequency is not predefined. The evaluation format depends on study progress (prior knowledge state test, formative test, summative test). The **learning environment** is for instance completely free and is in large defined by personal circumstances of the student. The **study plan** is free, but is biased by the prior knowledge state and personal capabilities.

Figure 1 represents the interrelations between the primary and secundary criteria in O.L.Systems.

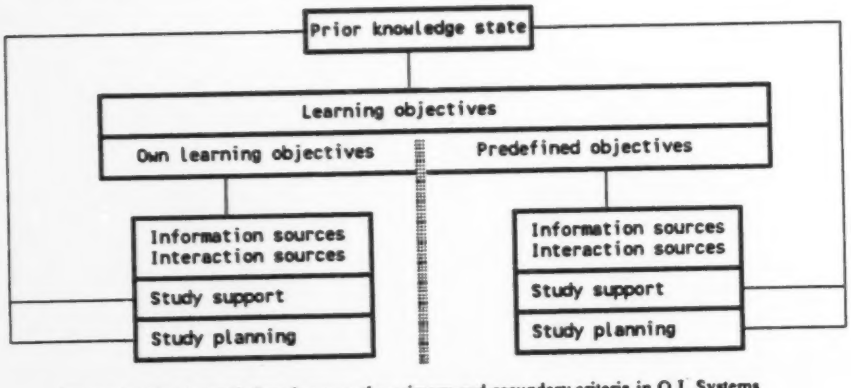


Figure 1 : The interrelations between the primary and secundary criteria in O.L.Systems

[4] See also Valcke & Dochy, 1991; Dochy & Valcke, 1991; Dochy, Valcke & Wagemans, 1991.

# 3. The multi-dimensional nature of "support"

The variety of initiatives in relation to "support", discussed in the context of open learning systems, can be structured along a variety of dimensions. Table 2 gives a brief overview of a set of these dimensions. Of course, this table does not give an exhaustive overview of possible dimensions. We tried to select those dimensions which, from a pragmatic point of view, are most useful for further discussion. Each support initiative can be classified along several of these dimensions.

Table 2 : The multi-dimensional nature of "support"

| | |
|---|---|
| Communication Dimension<br>written word letters<br>in-text support<br>support packages<br>audio-cassettes<br>phone one-to-one<br>audio-conferencing<br>computer ICAI<br>simulations ...<br>electronic communication<br>one-to-one contact<br>bulletin board<br>virtual classroom<br>video<br>video-conferencing<br>face-to-face student-student<br>student-tutor | INTERACTION DIMENSIONS |
| Initiative Dimension<br>student initiated<br>tutor initiated | |
| Orientation<br>individu-oriented<br>group oriented | |
| Content Dimension<br>domain-oriented<br>study skills<br>meta-cognitive skills<br>not-course related | CONTENT DIMENSION |
| Time Dimension<br>initial<br>unsystematic<br>regularly<br>continuous | ORGANISATIONAL DIMENSIONS |
| Geographical Dimension<br>study centre (regional)<br>student location | |

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It is not surprising that the **Interaction Dimensions** have been put on top of the table. Research and theory in relation to "support" builds heavily on this kind of dimensions to found the importance and necessity of support.
A large quantity of articles consider "communication" as a key feature of supporting the learning process[5] in order to personalize and humanize the learning system. This type of dimensions reveals at the same time that approaches towards support do reflect approaches towards education and/or learning; e.g. behaviorist/psychometric approaches, cognitivist/epistomological approaches, constructivist approaches, etc.

The **Communication Dimension** summarizes a large set of alternative channels, used to link the student with the "supporter" or support facilities. Bååth (1980, p.12) divides this set of alternative channels along two sub-dimensions to obtain the crosstable in figure 1. The "Type of communication" sub-dimension in the Bååth-scheme, clearly points at the highly appreciated two-way interactivity of support initiatives.

Fig. 1 : Various forms of distance education (Bååth, 1980, p.12).

| | Type of communication | | |
|---|---|---|---|
| | One-way | | Two-way |
| Mediation | By stored information | Teaching by means of various kinds of self-study material | Correspondence education |
| | Simultaneous teaching | Radio and TV | Telephone teaching CAI on line teaching |

The scheme of Bååth is already restricted to support initiatives in O.L.Systems and excludes e.g. face-to-face support initiatives, which can be put in the cell next to telephone tutoring and on line CAI. In literature, especially "face-to-face" contact is put forward. The use of telephone[6] and electronic communications is rather presented as an alternative for face-to-face communication. But, the rapid development of the new information technologies presents a variety of new communication facilities opening new ways to achieve communication; e.g. audio- and video-conferencing, virtual classrooms, etc. "Written word" represents a rather separate approach and reflects other functions of support (see part five). It comprises especially attempts to incorporate support into the learning materials (e.g. advance organizers, overviews, pretests, objectives, questions, text presentation, etc.). But also letters (computer generated or personal letters) and special support packages offer promising procedures to deliver support. The latter examples in relation to support on the communication dimension are of high importance, especially when focusing on Open Learning Systems since this type of education still largely depends on the written word as the communication channel : the nature and design of the mediating technology - through time and/or distance - defines the type of pedagogy reflected in the course. Some authors regret that even the newer interactive technologies used, have embedded within them a passive, individualistic view of the learner[7].
Whereas a lot of research as already been set up in relation to face-to-face communication and low-technology based communciation systems (written text, latters, phone, ...), controlled research in relation to high-technology based communication systems is still restricted in educational settings, in view of their relative innovative character (electronic mail, virtual classroom, wide area network, video-conferencing, ...).

[5] Cfr. e.g. Amundsen & Bernard, 1989; de Freitas & Lynch, 1986; Evans & Nation, 1989; Paulet, 1988; Peruniak, 1983; Persones & Catchpole, 1987; Scales, 1984; Sweet, 1986; Thorpe, 1986; Va'a, 1990; Willén, 1988; ...

[6] Flinck (1987, p.24) distinguishes 4 main modes of telephone-based support : teleteaching, telelecture, dial-access and teletutoring.

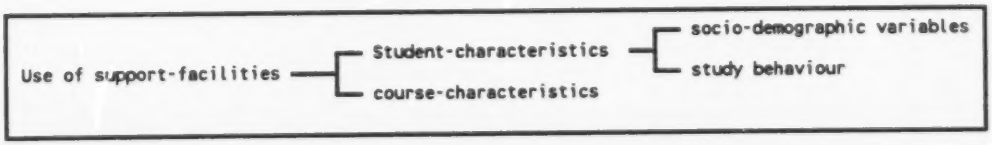
[7] See for instance Davies, 1989, p.205.

Depending on the degree of interactivity of the communication channels used, tutoring ranges from reactive (when immediate feedback is possible) to anticipatory (when no immediate feedback is possible and one tries to anticipate on possible difficulties).
Also the **Initiative Dimension** is important. This dimension reflects e.g. the extent to which support is an externally organised and built-in part of the study activity in a specific context or whether studying is considered to be a responsibility, mainly managed by the individual student him/herself. This dimension can again linked to the extent to which the support is of an anticipatory nature or set up ad hoc.
The **Orientation Dimension** shows whether support is oriented towards individual students or towards groups of students; of course in practice combination of both approaches do exist. This dimension can also be related to the theoretical base of the learning approach, adopted in the specific setting : e.g. learning is especially considered to be a 'social' process.
The **Content Dimension** in the table reflects a variety of concerns, linked to the content of the support initiatives. Next to the attention paid to the acquisition of domain-specific knowledge, also the development of more general skills is reflected in a variety of approaches. But a variety of support initiatives do not concentrate solely on task-related content. It seems to be of importance to pay also attention to not-course related issues.
The **Organisational Dimensions** are especially relevant for the context of open learning systems. This context constrains the importance to be paid to alternative approaches, presented by the other dimensions. The time dimension puts forward the delicate issue of "when" to intervene in the learning process, taking into account the freedom of the learner and the responsability of the educational institution.
The **Time Dimension** introduces important management issues in the provision of support. Initial support, continuous support, etc.. reflect different structural (and sometimes content-related) choices to set up support provisions.
The **Geographical Dimension** questions whether all support is to be home-based or to be based in regional study centres or whether support should be provided through a combination of both facilities[8].

## 4. The demand for support : student and course characteristics

In literature, it is - especially theoretically - accepted that the provision of support in the context of open learning systems might be helpful. A key feature is to what extent support depends on student characteristics or on course-characteristics. This dichotomy in relation to support provisions anticipates on what will be discussed in relation to the potential functions of support; especially when the points of view on the functions are discussed. Stressing the importance of student-characteristics indicates that one takes the point of view of the student. At the other hand, stressing the importance of course-characteristics indicates that one takes the point of view of the support-provider and education planner. Both approaches betray a deep concern with O.L.Systems' efficiency and effectivity.
The dichotomy in relation to support provisions also reflects that support provisions can both be dependent of independent from human interventions.

Table 3 : Interrelation between support-related variables




In research, the importance of both student-characteristics and course-characteristics is founded.

[8] There could hardly be found empirical research in relation to the functions and effects of support provided by study centres. Sewart (1981, p.15-17) emphasizes that it is important to re-define the role of study centres. It is wrong to see them soleley against the background of traditional education, as places in which conventional face-to-face contact takes place. Sewart rather stresses the role of study centres as transition places where students learn in accordance to the new traditions of indivudal and independent study.

At the one hand, the demand for support seems to be related to specific student variables (e.g. students at the beginning of their study, students with undeveloped study skills, age level, gender, educational background, etc.)[9]. These research findings help to support the role of student-characteristics in the above conceptual network. Within this research field, especially research in relation to the impact of prior knowledge (expertise) is of prime importance. Recent findings explain that among student variables "prior knowledge" helps to explain the highest percentage of variance in study success[10]. The role of "student-characteristics" puts heavy demands on the flexibility of support initiatives to be able to cope with individual differences.

At the other hand, there is a vast amount of research in relation to the organisation and structure of course materials to support learning (e.g. the role of advance organizers, in-text activities, assignments, etc). This research field will be discussed in more detail at various places in this text.

# 5. Functions of support

Defining functions of support implies the explicitations of ones' point of view. The function of support might be different when looking from (1) the position of the student, (2) the position of the support-provider and (3) the position of the planner of open learning systems. In literature, attention is mainly paid to the student's point of view. Robinson (1981, p.141) classifies for instance the student problems in distance education settings into three main categories and bases the functions of support upon these student needs : study techniques and learning difficulties, coping with the institution and personal problems. This is also reflected in some of the support function categories mentioned in table 4. But in our opinion, also the support-provider and especially the planner of open learning systems can benefit from support-facilities. Support-facilities can e.g. be used as feedback opportunities to amplify the effectivity and efficiency of the education delivered. This is also consistent with our definition of open learning systems where we stress the importance to be attached to the goal-directedness of education. Also Paine (1989, p.334-335) follows this idea when he mentions the following seven functions of support : "informing, advising, counselling, coaching, assessment, advocacy and feedback". In addition he stresses that both the organisation and the individual might benefit from efficient support activities.

Table 4 gives an overview of the variety of support functions. The category titles are based on the concepts found in literature. In order to save the rich variety of concepts used, we did not attempt to reduce the number of categories by summarizing them or looking for specific interrelations. Rather, we tried to indicate consistent clusters of support functions.

## 5.1 Non-cognitive support : Social-emotional support

Non-cognitive support comprises a variety of support-functions related to social-emotional problems in the context of open learning systems. The support provisions try to help the students to deal with the particularities of the context in relation to personal circumstances, prior needs, material and social limitations. Nicholson (1977) calls this "induction crisis". In table 4, this set of support provisions is also described as "person-centred" support.
A special sub-topic of this group of support-functions is labelled "advocacy". Isolated students are not in a position to form effective lobby groups. Additional channels are to be provided to press for institutional change when necessary (Mc-Innis-Rankin & Brindley, 1986, p.64).

[9] The research overview of Amundsen & Bernard (1989) and the research by Kelly a.o. (1988) and van Meurs a.o. (1990) is representative in this context. Kelly a.o. (1988) point at the impact of age level and van Meurs a.o. (1990) indicate the role of (lower) educational background of students. Kirkup & von Prümmer (1990) reveal significant differences in support needs of men and women in a distance education setting.

[10] Cf. Dochy, 1988; Ethington, 1990; Bruinsma & Geurts, 1988; etc.

Table 4 : Functions of support

<table>
<tr><td>- enhancing the social integration<br>- managing geographical isolation<br>- supporting the affective domain<br>- learning to tackle study problems<br>- enhancing student participation and involvement (advocacy)<br>- enhancing motivation<br>- promoting equal opportunities<br>- creating a sense of identity</td><td>SOCIAL-EMOTIONAL SUPPORT<br><br>(person-centred)</td><td>NON-COGNITIVE SUPPORT</td></tr>
<tr><td>- informing about financial aids<br>- planning the study (what kind of courses, follow-up of courses, career planning...)<br>- supporting time management (pacing)<br>- clarifying the structure and functioning of the educational institute<br>- defining academic preparedness and referral<br>- defining the expectations and reality of learning<br>- supporting change from regular education to distance education<br>- settled connection</td><td>ADVISING<br>(problem-centred)</td><td rowspan="3">COGNITIVE SUPPORT</td></tr>
<tr><td>- optimizing academic skills<br>- learning to learn (study skills)</td><td rowspan="2">CONTENT-ORIENTED SUPPORT<br>(academic)</td></tr>
<tr><td>- providing feedback<br>- enhancing the disclosure of learning materials<br>- enhancing disclosure of new information (resources)<br>- exercising</td></tr>
<tr><td>- optimizing the quality of support</td><td>QUALITY-CONTROL OF SUPPORT</td><td rowspan="2">QUALITY-CONTROL</td></tr>
<tr><td>- optimizing open learning systems</td><td>QUALITY-CONTROL OF EDUCATION</td></tr>
</table>

## 5.2 Cognitive support

In table 4, a distinction has been made between advising and content-oriented support.
**Advising, or problem-centred support** comprises a set of support-functions aiming at the integration of studying in the daily life of the student; often a neglected problem field. A special facet is the "settled connection" support : it implies guidance at recurrent choice points (Clement & Marquis, 1979, p.37). Another distinctive feature is the assessment of academic preparedness and referral[11]. Evaluation of prior knowledge requirements are helpful to guide curricular and career choices of students with varying backgrounds.
The **content-oriented or academic support** focuses on the scaffolding of the learning of the students : objectives, learning content, background information, learning activities, evaluation, etc. It includes a continuous 'illuminative' and goal-based evaluation (Scheumer, 1991, p.9).

## 5.3 Quality control

Quality-control is a neglected support function in most current O.L.Systems initiatives. In supporting students, information can be gathered about the quality of the educational provisions. This is especially true if support implies the investment in face-to-face support provisions. Support can - in this way - have a feedback function, thus improving the educational provisions. In relation to this issue, we could not trace empirical research reports. therefore, some rather general attempts are described. Naylor, Cowie & Stevenson (1990) - in a recent issue of Open Learning - present one of the rare articles in relation to this issue by claiming the value of feedback from students and other tutors. At the UNED of Costa Rica, quality control is the responsability of a special unit. The data used to raise the academic quality are solicited from - among others - the tutors and students.[12] Lappia a.o. (1989) suggest that it would be helpful for course instructors to routinelu evaluate any teaching innovations. They evaluate e.g. a course where audio-tapes complement printed study materials to detect how students react to this new provision. Research might therefore also be a part of support provisions to examine the effectiveness of support services, to identify student characteristics, need for services, assistance to academic units in the design of studies, etc.

# 6. Effects of support

As mentioned in the introduction of this article, the concept "effects" refers to a variety of - predicted and expected -outcomes, consequences, implications, results of the support activities.
The "effects", researched in literature, can be classified into two main categories : study success and persistence (including motivation)[13]. We summarize the findings of these studies and link them to the dimensions mentioned above and the functions explicitated. Research in this field is marred by a variety of constrains : the student population to research is difficult to reach; drop-out reduces continuously sample sizes; lack of possibilities to control treatments affect the design of long-term research; etc. As a consequence, it is not unexpected that many research projects do not reveal significant results. Nevertheless, the theoretical background of these research attempts are helpful.

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[11] Cf. the provision at the Athabasca University (McInnis-Rankin & Brindley, 1986, p.70).

[12] Alvarado, D'Agostino & Bolaños, 1991, p.49. Also in India (Indira Gandhi National Open University) a large amount of attention is paid towards this feedback function of evaluation in relation to tutors (Koul, 1991). But also at other institutions, tutors become involved in the overall evaluative process of distance education (Rekkedal, 1991, p.199; Woodley, 1991, p.214).

[13] Although both concepts are clearly interrelated in the students' mind, in literature both potential effects are dealt with and researched in clearly separate ways.

One can wonder why we focus on "study success" and on "persistence" and not on the effects in terms of the functions defined in table 4. When looking at specific research projects, we discern that support serves the diversity of functions as defined in our table, but that researchers pay most attention at the outcomes of support initiatives, overlooking the very specific interrelation between support type, functions and effects. First of all, this is not easy. In most research reports, explaining the significant or non-significant support-effects is done in a general way or by focusing on methodological issues. But in part 8 of this text, we will nevertheless try to deassemble the interrelations between support type, functions and effects.

When discussing the research results, each project could be positioned against the variety of dimensions discussed above. Only when a project does focus in a particular way on more than one specific dimension, it will be discussed repeatedly.

## 6.1 The interrelation between "support" and study success

"Study success" refers to a variety of - especially - quantitative parameters for study outcomes like achievement, grades, final academic standing, etc. In research, this type of effect-studies has especially been set up when looking at the link between types of support and study outcomes[14] :

### 6.1.1 The communication dimension

"Communication" is - in literature - presented as a key component of education in general and learning in particular. But, as mentioned earlier, it presents problems in the context of open learning systems. Already a variety of approaches have been developed and researched to "re-integrate interpersonal communication" (Amundsen & Bernard, 1989, p.8) in a distance education and open learning setting.

#### a. The impact of incorporating support into learning materials

The development of the new information technologies opens up a new potentially significant field for support provisions. At the one hand, the use of computers presented a first challenge to instructional designers. But research could hardly support until now[15] the educational value of computer-supported education; moreover, these research attempts do not explicitely concentrate on the built-in support provisions. Exceptions to the latter cluster of research are e.g. the projects set up in the context of the DELTA-program (1988-1995) : "Tutoring and Monitoring facilities for European Open Learning" (Whiting & Bell, 1987). But these research projects concentrate on the technological side of the problem (sometimes even are still restricted to problem identification and specification) and have resulted - as yet - not in applied research in educational settings.

On the other hand, there is in literature a vast amount of exploratory research in relation to teleconferencing, videoconferencing, hypermedia, etc. But, the amount of controlled research procedures remains rather restricted. Most reports reflect enthousiastic, even prophetic, opinions about the futur potentialities. This is in sharp contrast with research in relation to the more traditional educational media, based on the use of the written word.

[14] In reporting the research results, both research revealing "statistical" significant and "practical" significant results will be discussed.

[15] Cf. the research review by Clark, 1983.

In this field, the impact of "incorporating support into learning materials" has been intensively evaluated in relation to a variety of support functions[16]. In general, these functions can be summarized with the term "scaffolding".
Since written materials are also of high importance outside O.L.Systems it is no wonder that reserach in this specific area has already a long history. The development of materials for O.L.Systems can therefore rely on the results of these studies[17]. The main part of the discussion of examples and research about incorporating support into learning materials is therefore presented in part 7 of this text.

Research focusing on the development and use of materials for O.L.Systems is highly needed. In the settings of O.L.Systems, the interrelation between the actual design of the learning materials and support systems might be forgotten as Hodgson puts it : *"Generally, research has focused either on the design and development of learning materials or the role and function of support systems. The interrelationship between learning materials and support systems has not been a major focus of attention."*[18].
Many researchers have indicated that the expectations of course developers and writers have not been met since students seem to use the learning materials in a completely different way as they are expected to do[19]. This brings Marland & Store (1982, p.90) to the conclusion that course developers need a "new brand of consumer psychology -a psychology of distance learning dealing, inter alia, with how distance learners use, process, and react to instructional materials.". Moreover, the use of incorporated support ideas has to be balanced against the educational theory in which open learning systems are ground[20]. The rigorously elaborated materials reflect e.g. a rather teacher-centred approach to learning and the question is if faith in this approach is justified. One can e.g. imagine that it might be more effective for learners to develop their own summaries, questions, concept-maps, etc. But also this assumption might not hold, since it views students as active, meaning-seeking learners, which oppose to surface-learning and go beyond the micro-level of the text (Marland, Patching, Putt & Putt, 1990, p.84). But, does the latter position reflect reality ? Waller (1979, p.180) refers for instance to the purpose/style of the reader of an educational text that might be in conflict with the designers' objectives (e.g. entertainment, browse, review, study in depth, search for item, decide to/not to use, ...). Moreover, the same author shows evidence that texts are not read in a lineair fashion (although texts are on the whole a linear sequential medium) but readers rather apply selective reading strategies.
More research is needed to be able to defend approaches to incorporating support into learning materials, especially focusing on the actual use of the materials by the students. England (1987, p.12) suggests in this context to look at the interrelation between learning styles (holists, serialists, versatile, ...) and uses of materials[21]. This introduces a last remark: the heterogeneity of the student population is to be taken into account. What might be valuable and effective for e.g. beginning, young students might be irrelevant for older students with undeveloped study skills.
Examples of this research direction can be found for "in-text activities" and "assignments" as examples of support incorporated into learning materials :

* **In-text activities**

In a recent research project (Marland, Patching, Putt & Putt, 1990, p.85-86) researchers found that - although the use of in-text activities looked promising -students did react negatively to this type of support ideas. They even exercised their veto-power against them. The authors think this is the result of a complex set of variables like time constraints, survival need, assessment loads, surface approaches to learning, etc. Moreover, the authors think that the use of in-text activities is only relevant if the text itself is reduced and allows for in-depth study and is structured in a way that invites an interactive and organic view of learning.

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[16] The following authors give an extensive overview of past and recent research in this field : Marland & Store (1982) and Marland, Patching, Putt & Putt (1990).

[17] The reviews, written by Marland & Store (1982) or Macdonald-Ross (1977) are comprehensive examples of this approach.

[18] This is confirmed by her own research findings : "The interrelationship between the OU-tutorials was more with the assignments than the actual learning materials(...)." (Hodgson, 1986, p.56-60).

[19] We refer for instance to Marland, Patching, Putt & Putt (1990); Marland & Store (1982); Clyde, Crowther, Patching & Store (1983).

[20] See also England, 1987, p.12.

[21] Vermunt (1986) discusses in this context the necessity to link learning styles (a in-dept approach, a strategic approach, a serialist approach and a survey approach) tlo four guiding styles (self guiding, limited self guiding, external guiding and no guiding).

* **Assignments**

Fritsch & Strõhlein (1988, p.31) could conclude that the influence of additional assignments is significant for examination performance. Clyde and other authors[22] discovered that assignments can also have a negative side-effect since students tend to focus mainly on the assessment activities, thus redirecting their general pattern of study and use of study time.

Kempkens (1987, p.60) finds that slow students tend to solve the assignements to a higher extent than drop-out students ($p = .01$). Moreover, she discovers that all students rarely use - next to the written courses - the extra study-materials (video-disc, audio-tapes, etc.). These findings are important in terms of time-management. When course developers develop e.g. time-consuming support facilities, this might result in not using them.

* **Questions**

Duchastel & Whitehead (1981, p.41) describe a survey carried out on a sample of Open University students in order to assess the value they attach to inserted questions in study materials. Student reactions were supportive of the notion that inserted questions were useful adjunct aids to learning.

**b. The impact of student-tutor communication**

It is not easy to describe the relation between student-tutor communication and study success as a linear and causal relationship. Rouse[23] suggests - based on a research review - that the students acknowledge that this relationship with their tutor makes a significant contribution to the success of their studies. A friendly experience with the tutor is an essential basic ingredient of the whole thing : *"The social link between tutor and student is thus perceived as a catalysis of the study process."*. Besides this social-emotional aspect of the tutor-student interrelation, also rather cognitive functions are based on this interrelation[24]. Empiric research seems to validate the positive impact of student-tutor communication for both main functions :

- Amundsen & Bernard (1989, p.9-10) give an overview of research results in this field. Only a limited amount of studies seem to detect significant effects because of student-tutor contact. Other factors seem interact with this support variable.
- Fritsch & Strõhlein (1988, p.29) obtained for instance very particular results : they discovered that mentor contact - in combination with additional assignments - is very helpful in terms of academic achievement because it at least guarantees that some time is spent effectively on the subject matter of the course. Yet, study centre attendance seemed not to be relevant. This brings both authors to the concluding questions : "What do students in study centres throughout the year ? What do mentors and students talk about ?". Answers to these question could suggest that this particular kind of tutor-student contact serves other functions.
- Also the research results of Jeram (1988, p.51) can help to explain inconsistent research findings. These authors analyzed responses to a questionnaire and revealed that students - if asked whether they wish to have more support and from whom - thought they would learn better if they had more support from contact with other students (35%).

This high percentage stands in contrast with the 4% of students asking for more tutor support to sustain their learning.

- Bååth (1980, p.48) gives an overview of research projects focusing on the interrelation between correspondence support and achievement. In cases where significant differences were established (a minority), they consistently favour the correspondence students.

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[22] Clyde, Crowther, Patching, Putt & Store, 1983, p.25.

[23] In a book review by Imam (1987).

[24] Cf. the role of the tutor in the UKOU-system, when enabling students to become independent learners.

- Flinck (1978, p.68) discovers that telephone tutoring does result in significantly higher achievement scores for students in the experimental group, depending on the course-type (French : sign.; economy : not sign.). Apart from these findings, the results of his study also reveal that - although the phone calls were initiated by the tutor - the initiative to talk about subject-matter-related topics are mostly initiated by students. This indicates that the telephone calls serve a function in the instructional process.
- A study of Holmberg & Schuemer (1989) reveals no significant differences between students who receive higher or lower frequencies of assignment submission when looking at final test scores.

**c. The impact of student-student communication**

The emergence of study groups has been observed from the very beginning of in O.L.S.[25]
Jeram (1988, p.52) argues that it might be more relevant to spend extra money in promoting contact in-between students.
Holt, Petzall & Viljoen (1990) promoted especially the use "study groups" as part of the curriculum pedagogy in a distance education context [26]. The students reported "better learning" as a result of the group interchange of ideas.

### 6.1.2 The time dimension

In literature especially the importance of "initial" has been researched. van Meurs e.o. (1990, p.58) researched for instance the interrelation between study success and the extent to which students made use of initial support facilities. The authors came to the striking conclusion that students, which rely heavily on support facilities, are not very successful in terms of study outcomes. The researchers of this study analyzed this negative correlation and detected that - analyzing characteristics of the students, making heavily use of initial support facilities - these students have many problems with studying and studying at a distance. In other words, making use of the support facilities does not cause weak study success, but reflects specific study difficulties of the students involved.
A consistent finding of this study reveals that the students with high study success, don't express a heavy demand for this initial "support".

### 6.1.3 The content dimension

No research findings have been collected in relation to the impact of specific content approaches to support. Therefore only general information or some exploratory studies will be reviewed.
Holmberg (1986) gives an overview of support approaches to improve study skills. The variety of approaches try to develop a "deep learning" attitude (versus surface learning) and try to take into account individual differences in students (serialists, holists and versatile students[27]).
Jeram (1988, p.51) asked students whether they wish to have more support and from whom of how. 29% of the students thought they would learn better if they possessed a guide on how to study and learn from the course materials.

### 6.1.4 The initiative dimension

Above, we already discussed the research results of Flinck (1978, p.68) who could reveal that - although the phone calls were initiated by the tutor - the initiative to talk about subject-matter-related topics are mostly initiated by students. This indicates that the telephone calls serve a specific function in the instructional process.

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[25] Following Daniel & Marquis (1979, p.40).

[26] In their setting, the participants were geographically proximate and had relatively easy access to the study group venues.

[27] The differentiation of holist, serialist and versatile learning style is based on the work of Pask (1976).

## 6.2 The interrelation between "support" and persistence

As mentioned above, "persistence" is the general denomination for a variety of operational definitions. The provision of support facilities seems - in large - to be positively related to "student persistence".
Persistence is opposed to "drop-out". Dropout has been intensively studied in distance education settings. It is remarkable that much of this research bears on theoretical findings in non-O.L.S. settings. Tinto's model (1975) is important in this perspective, since it is widely used to describe and explain student drawback in a distance education context. The drop-out model of Tinto contains two elements that are of importance for the actual discussion, since Tinto regards persistence largely as an outcome of a student's academic and social integration. Academic integration includes students' involvement with intellectual activities and services. Social integration reflects the student's participation in extra-curricular life of the campus. Experimental research in O.L.S. settings seems to validate[28] this model and confirms that the level of academic and social integration of students play an important role. This implies that especially along the communication[29] dimension, research and research findings will be of importance especially at the level where explicit contact is made or planned (e.g. by phone calls, written assignments, problem sets, questions) between students and tutor or students mutually.

### 6.2.1 The communication dimension

A variety of communication channels are used to support students in view of preventing them from drop-out. Simpson (1988) researched the impact of self assessment correspondence counselling. She distinguishes four kinds of correspondence counselling : direct (the "problem page" in a student newsletter), straight text, experiential (taster packs) and self assessment texts. The approach of Gaskell, Gibbons & Simpson (1990a & 1990b) fits into the latter approach. "Taking off" and "Bailing out" were two self assessment texts to encourage students to undertake some self-analysis when starting distance education studies and when withdrawing. The authors could uncover qualitative support for their value.
The research results of Rekkedal (1989, p.23) reveals that students offered telephone-tutoring complete a higher number of courses and have a higher pace of study; but the differences are non-significant.
Laaser (1987) provided counselling through individualized computer letters, composed from a series of different text modules, selected according to students' response patterns on a questionnaire. The initiative has been dropped; because of the lack of real dialogue, the time delay and the fact that students could not react to the advice given except by writing in reply.
Analysis of responses to a questionnaire in a study of Va'a (1990) helped to reveal that letters as forms of intervention seemed to be more valuable than telephone calls.
Sweet (1986, p.203) used telephone support and found that this kind of support enhances the "social integration" of the students, accounting for a significant proportion of higher study commitment and persistence. Peruniak (1983) warns for too optimistics views about the impact of phone contact. He discovered for instance that there were over three times as many student-initiated telephone calls for the completers as opposed to withdrawers. His analysis of student perceptions and reactions in a distance learning context reveals that relying on student initiated support could miss opportunities to obtain a higher persistence rate since withdrawers are reluctant to ask for specific support. As to the function of support, especially time-management could be helpful to improve completion rates. Scales (1984, p.272-273) found a significant (but modest) correlation between the number of calls and the number of assignments completed in a distance learning course. Important is that especially the student-initiated calls have a significant impact.

[28] Cf. the research overview of Kempkens, 1987.

[29] Kempkens (1987, p. 16) refers e.g. to the adaptation of Tinto's model by Bean & Metzener (1985) who clearly indicate that especially "social integration" is an important variable to predict attrition in O.L.Systems.

Persons & Catchpole set up two studies to research the impact on drop-out rates of audio- and video-teleconferencing. They could not detect significant differences[30] by using alternative approaches.
Bååth (1980, p.47) gives an overview of research projects, controlling the impact of using encouraging letters, reminders,... in a correspondence education setting. He concludes that most studies report a favourable impact on study perseverance. If correspondence education is combined with face-to-face contacts, most studies seem to report higher proportion of starts and course completions, as well as a higher study rate. But at the same time Bååth indicates, that the inclusion of face-to-face contact might imply constraints with regard to time and place of studying, which do not encumber in pure correspondence (and distance) education.
In his own large-scale - and classical - 1980-study in Norway, Bååth comes to the following conclusions :

- Various degrees of submission density lead to significant differences in starting courses, but no such significant differences are to found in relation to course completion.
- Various quantities of assignment questions on each submission lead to no significant differences with regard to study perseverance.
- Students which followed computer-assisted two-way communication, compared to traditional correspondence education, completed their course to a significantly greater extent.

A study of Holmberg & Schuemer (1989) reveals no significant differences between students with higher or lower frequencies of assignment submission when looking at their start or completion rates.
Yule (1984) gives an overview of research in relation to pacing-attempts, in order to prevent drop-out at the University of South Africa (UNISA). Successful attempts comprise the use of study guides, assignments, tutorial letters, audio cassettes and videotapes.

### 6.2.2 The initiative dimension

Whether support is initiated by a tutor or a student does not make a difference in the research results. Both approaches seem to enhance study persistence. Simply the fact of having extra support seems to be more important than the instance who launches contact. We give some examples of research results.
Research results of Rekkedal (1989, p.32) confirm the positive impact of tutor-initiated telephone contact. The fact that the tutor stimulates and initiates telephone contact, results in very few students actually missing telephone contact.
Scales (1984, p.272-273) found a significant (but modest) correlation between the number of calls and the number of assignments completed in a distance learning course. Important is that especially the student-initiated calls have a significant impact.
Peruniak (1983) could reveal a positive correlation between student-initiated telephone calls and study-completion.

### 6.2.3 Content Dimension

Especially the impact of introductory courses, focusing on study skills and time management have been researched. The first research project discussed is an exception to this rule.
In the study of Sweet (1986, p.203) the impact of telephone support - focusing on course-related topics, organizational matters, career concerns, personal problems and social exchanges - seemed to enhance the "social integration"[31] of the students. This higher level of social integration accounted for a significant proportion of the variance in study commitment and persistence[32].
Rekkedal (1986, p.191) provided the students with an introduction to study techniques. This caused significant changes in drop-out rates. A parallel project of de Freitas & Lynch (1986, p.191) analyzed the impact of an "introductory course" on withdrawal from the university. In this course attention was paid on study time management.

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[30] The insignificant results could be due to the small number of students and a ceiling effect. Moreover it is possible that the two alternative approaches served the same function to the same extent.

[31] Cf. Tinto's model.

[32] Important is that background characteristics of the students did also explain a significant proportion of the criterion variance (11%).

This course was highly appreciated by the students. Moreover, research revealed that this satisfaction level was a significant predictor for non-withdrawal (28%). This is also consistent with the findings of Peruniak (1983) discussed above in relation to the impact of phone tutoring, focusing on time-management. As indicated earlier in this text he could reveal a positive correlation between student-initiated telephone calls and study-completion.
The approach of Gaskell, Gibbons & Simpson (1990a & 1990b) has been discussed above. These authors developed self-assessment texts. Qualitative support could be gathered to support the value of these texts to prevent drop-out.
Kempkens concluded - after path-analysis - that among a large set of variables, "giving information" in study-centres is not an effective predictor of drop-out.

### 6.2.4 The time dimension

Va'a (1990) provided students with "intervention support", during periods been identified as critical withdrawal periods and delivered by means of telephone/letters. This type of intervention seemed to lead to significant higher retention rates.
Rekkedal (1986, p.47) paid especially attention to beginning students. He indicated that research in distance education shows that drop-out is especially a serious problem during the first part of courses, before the students have acquired some experience with the subject and the study method[33]. Initial support by a counsellor/tutor was therefore considered essential. This support consisted of providing the students with an introduction to study techniques. The students in the experimental group had a significant higher completion rate, were more active and completed a larger number of units and courses during the experimental period (Rekkedal, 1986, p.47).
Fritsch & Ströhlein (1988, p.29) could conclude that support is helpful in preventing draw-back, but also that there is an interaction effect with the moment the support was provided. Especially mentor contact in the first assignment period has a preventive effect.

# 7. Effects of support in general higher education : Research findings

## 7.1 The interrelation between "support" and study success

### 7.1.1 The communication dimension

#### a. The impact of incorporating support into learning materials

As mentionned earlier, the impact of "incorporating support into learning materials" has been intensively evaluated in relation to a variety of support functions[34]. In general, these functions can be summarized with the term "scaffolding". Since - based on our review of the literature - most research in this field has been set up outside O.L.Systems, we discuss infra the specific alternative approaches in more detail compared to other support facilities in this text.

[33] This fact is confirmed and accepted by most researchers. For an overview of research in this field cf. Bååth (1980, p.47).

[34] The following authors give an extensive overview of past and recent research in this field : Marland & Store (1982); Marland, Patching, Putt & Putt (1990) and Wright (1977).

*** Advance organizers**

The concept "advance organizers" refers to a series of approaches that present the learner with a structured set of ideas (in prose format or as a scheme), prior to the presentation of the learning content[35]. A meta-analysis of 135 research projects in relation to the effects of advance organizers on learning and retention by Luiten a.o. (1980) reveals that they have a facilitative effect on learning and retention[36]. Practice and research shows that the concept "advance organizers" rather refers to a set of approaches than to a uni-directional approach in structuring the learning activities of students[37]. Marland & Store (1982) mention moreover that this positive impact is especially high with university students, is important in relation to higher cognitive levels and retention and is linked with transfer of knowledge. Lawton & Wanska (1977, p.240-241) also indicate that the efficacy of advance organizers is only effective if students have really a need for them; i.e. when they do net yet possess relevant "ideational scaffolding" to which potentially meaningful new knowledge may be related or when reorganization, clarification or extension of existing knowledge is needed. Mayer (1979, p.381) adds to this that they have to be used in appropriate situations.

*** Overviews**

Overviews can be considered as summaries of salient points or glossaries of key terms. They are of the same level of abstraction as the subsequent material. The concept "content map" gives a indication of the potential function of overviews : they help to find the way within texts and are considered to assist information recall. Very little research has been done in relation to the potential benefits of overviews. Marland & Store (1982, p.81) refer to the results of the research overview of Hartley & Davies, which conclude that overviews have a positive effect in the majority of studies; but these studies were not set up in the context of open learning systems. Recently, Marland, Patching, Putt & Putt researched learners' interactions with text while studying, and found that the use of cross-referencing (a type of concept-mapping) was especially useful in helping the students in the process of linking[38].

*** Pretests**

The use of pretests, to support future learning, is a widely spread practice in written course materials. But this popular strategy has hardly been researched. The only studies, found in literature, cannot sustain its full potential (Hartley & Davies, 1976). Therefore, they are rather considered as access devices to subsequent learning materials.

*** Assessment (initial and continuous)**

Recently, Snow argued for the assessment of initial states and attention for dayly and weekly knowledge transitions and for monthly progress in a course (Snow, 1990). Snow and Mandinach (1989) showed that assessment procedures can be designed to be much more indicative of student progress than are the tests which we use mostly. Tests should display to the learner models that can be emulated and also indicate the assistance and forms of practice required by learners as they move toward better performance.
In their work, Glaser and colleagues argued that assessment is an appropriate basis for instructional guidance (Glaser, Lesgold & Lajoie, 1987).

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[35] The notion of advance organizers has been developed by Ausubel in relation to his theory about meaningful verbal learning. The purpose of the organizer is to relate the potentially meaningful materials to be learned to the already existing cognitive structure of the learner (Ausubel & Robinson, 1969; Ausubel, 1963, p.23).

[36] See also Wright & Conroy, 1988, p.87.

[37] Barnes & Clawson (1975, p.654) make e.g. a distinction between written, simulation-game, graphic, visual and audio types of advance organizers.

[38] See also England (1987, p.13-14) for some practical examples.

**• Objectives**

The incorporation of clearcut objectives in learning materials can be considered as an exponent of a generally accepted rationality and an end-means logic in educational planning. It is expected that explicitation of objectives will facilitate learning, help to promote selective attention and decrease incidental learning, ... [39]. But research cannot satisfactory support the face-validity of this widespread practice. To explain these unexpected results, researchers indicate that a variety of complex conditions[40] govern whether or not the use of objectives is relevant and/or effective; for example : position in the text, interaction between objectives and importance of text elements, degree of generality of the objectives, the degree of structure of the text, frequency of insertion, the characteristics of the students involved, etc. Descriptive research also reveals that students don't use objectives in the way they are expected to use them : not as attention-directors, but rather as access devices. This routing of the learning path can have a negative effect on incidental learning; the use of objective can therefore be considered as an exponent of a top-down approach to teaching and learning.

**• Questions**

In research, associated with "questions" a "variable orientation" and a "process orientation" can be distinguished (Ricks & Denner, 1978, p.313). The first orientation focuses on the effect(s) of question position, questions frequencey, cognitive levels of inserted questions, ...; the second orientation rather looks at the generation of questions while reading.

The potential positive effect of inserting questions in learning materials seems to depend on a variety of conditions[41], but overall research reveals that its value is acceptable to generate a review-process, to facilitate the learning process and to heighten attention.

**• Prequestions**

Data obtained from research with prequestions gives support to theoretical claims about the activation of prior knowledge, thus increasing successive learning. The data particularily provide support for the instructional practice of encouraging readers to attempt to answer prequestions before reading (Pressley, Tanenbaum & McDaniel, 1990).

**• Words and phrases**

It seems that the specific choice of concepts and phrasing of ideas does provoke thinking of the students. But this thinking does not extend beyond the micro-level of the text. This brings the researchers to the conclusion that : "The distinction between understanding at the micro-level (words and phrases) and understanding at the macro-level (theories, themes and areas of knowledge) highlights (...) a crucial differences between surface and deep conceptions of learning." (Marland, Patching, Putt & Putt, 1990, p.84).

This confirms what was suggested earlier, that students do not always use support ideas in the way they are expected to do.

**• Text presentation (typography)**

In general, typographical differences do not influence learning results. But, this research literature remains nevertheless very interesting. Research, focusing on the typographic presentation of written learning materials do reflects a specific approach to the learner. Waller (1979, p.181) assumes e.g. that the reader is an active participant; he/she seeks and finds information rather than he/she processes information in a passive way. Typographic variations determine as a consequence the access structure of educational texts. The research overview of Waller, does not show consistent results. Waller refers especially to a lack of sound theoretical base in most research and methodological errors to explain the weak or conflicting research results. Marland & Store mention that typographic features have three functions : transactional (communication), stylistic (cosmetic) and structural (global and local access). But also these research reviewers come to the conclusion that there is hardly research that supports the value of typographic text presentation in the context of open learning systems.

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[39] Duchastel (1979, p.100-101) gives an early overview of research in this field.

[40] For an overview, see Duchastel (1979, p.100-101), Marland & Store (1982, p.84-85), Meyer (1975), Meyer & Duchastel (1973).

[41] Marland & Store (1982, p.91-95), together with other authors mention as key conditions : type of question (high-level of low-level), position of inserted questions, timing or frequency, response mode and the provision of model answers, etc.

Later research analysis of Marland, Patching, Putt & Putt could not help to conclude that headings and underlining of text did provoke thought in their students (Marland, Patching, Putt & Putt, 1990, p.83).

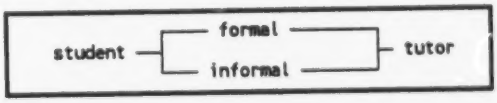
**• Text documentation (graphics, graphs, charts, tables, cartoons, photographs, ...)**

The research in this field is abundant and provides us - next to indications about their positive impact - with a list of advices as to how and when to use this kind of test presentations[42].

The use of non-verbal devices is not always reported as being positive. Sometimes, they are largely ignored by the students, especially if they are peripheral or supplementary to the content of the text. The only exception is when the text presentation devices are not merely adjuncts to the text. Examples of the latter are 'tables'. Marland, Patching, Putt & Putt found that tables provoked thinking because they invited students to check their own perceptions and expectations in relations to statements on the text; moreover, the text itself contained many references to the tabulated data (Marland, Patching, Putt & Putt, 1990, p.87). Not only the link between the type of text documentation and the text in general is important, but also the fit between the implicit assumptions about the strategical use of the text documentation and the strategies individuals use to access and process text information. Szlichcinski (1979, p.253) researched for instance the benefits of diagrams and illustrations to aid problem-solving and found that a designer must make his graphics compatible with as wide a range of strategies for using them as possible while building on the knowledge the problem solver already possesses.

### b. The impact of student-tutor communication

In regular higher education, teachers/professors switch continuously - and oftenly implicitely - between their academic role and their tutoring role. Since "education" in regular education is nearly completely dependent on "direct communication" between students and tutors, there is vast body of research in relation to the effectivity of student-tutor communication.




Another particularity of the interaction between faculty members and students in higher education is that a distinction is to be made between "informal" and "formal" contact. The formal contacts are based on the structured academic interactions between students and faculty members. Informal contacts are non-class contacts but can be related to academic issues.

### b.1 The impact of informal student-tutor communication

It is one of the persistent assumptions in - especially American - higher education that close contact between students and faculty members is beneficial to the student. Pascarella reviews research in this field and comes to the conclusion that there is a modest but statistically significant positive association between informal non-class contact with faculty and educational outcomes, such as (Pascarella, 1980, p.564) for instance : satisfaction with college, educational aspirations, intellectual and personal developments and academic achievement. But this authors also remarks that the type and quality of the student-faculty interrelation is important and that the impact varies for different kinds of students.

[42] See Marland & Store (1982, p.99-104) for an overview of research findings and a summary of guidelines and ideas.

### b.2 The impact of formal student-tutor communication

Next to the informal instructional activities of educators, support activities, promoting the academic integration of students can be part of their responsability. As said before, empiric research in this area is restricted. There are examples of evaluations of special support programs and there is a relatively important amount of A.T.I.-research that can be discussed in this context.
In relation to the former, Frost (1989, p.1-18) gives a research overview, selecting studies that help to justify the interrelation between student-faculty contact and study success. She also sets up a research project to explore the relationship between academic (developmental) advising and cognitive development. Cognitive growth scores were not explained by the frequency of contact[43], but in contrast the advisory "style" helped to explain a significant proportion of the variance (6.5 % and 5 %) in cognitive growth scores.
Curby (1984, p.7-15) set up two studies to test the effectiveness of help sessions in Learning Centres at the university campus. She concludes that students who sought academic assistance were mainly of lower ability but either performed on par with higher ability students or better than predicted after participation in the help sessions.
Typical examples of the latter are the attempts to adapt instructional support to the individuals' aptitude and learning performance/achievement. Aptitude-Treatment Interaction-research (A.T.I.) does not help to guide in a consistent way support attempts in this field : the empirical evidence of A.T.I. has tended to yield conflicting or nonsupportive results. Nevertheless, recent meta-analytic analysis revealed that A.T.I.s are present but that students with higher prior achievement benefit more than students with lower prior achievement from an increase of instructional support[44].
Another research direction - besides A.T.I. research - examines the role of mentors and their relationship with the adult learner. In this study of Liley & Newton (1990), the data lend support to the view that mentorship is considered as a learning resource by the students and that students rather consider the mentor as an interesting source of feedback. The mentor is expected to links his support to the learning process of the student. This introduces at the importance of student initiated support.

## 7.1.2 The content dimension

Schmidt (1987) present an overview of variables that influence directly study outcomes. In his scheme, he also indicates the % of explained variance, each variable (or set of variables) does account for when summarizing the research results.

| | |
|---|---|
| study strategies | 10% |
| prior knowledge | 30-60% |
| quality of education | 5-15% |
| motivation | 0% |
| study time | 15-25% |

In relation to the content dimension of support, the first two variables are of extremely high importance :
- Research focusing on the development of study skills reveals that the long-term and transfer value of the learning experiences are restricted. As a consequence, one can question the relevance of initiatives aiming at the developemnt of study skills, study guides, productive thinking programs, etc. Other researchers have indicated that the development of these skills is only effective, if the learning skills programs are linked to a specific content domain[45]. Zuber-Skerrett (1988, p.63) even indicates that this has not only to be done in relation to initial, introductory courses, but conceives it as valuable if implemented throughout undergraduate and postgraduate programmes.
- If prior knowledge is thus important, sound educational practice has to be based on prior knowledge and has to take differences in prior knowledge between students into account[46]. In reviewing literature, we found no research attempts to realize this focus on the role of prior knowledge.

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[43] This is in sharp contrast to the results of comparable research projects. The author herself indicates that this might be due to the design of her study since students could not easily differentiate between advisory contact and overall institutional contact.

[44] Whitener (1989) gives a recent and fairly complete overview of the state of the art in A.T.I.-research.

[45] See for example Zuber-Skerrit, 1988;

[46] Cf. Dochy, 1988; Dochy & Bouwens, 1990.

## 7.2 The interrelation between "support" and persistence

Also in regular higher education attrition/retention is a major problem. Titley & Titley (1982, p.46-47) mention e.g. attrition rates of 40% for those who enter college and university. They even predict a scenario for the next 10 years with growing attrition rates, taking into account the raising costs of studying and the cutbacks in financial support for those who want to study in colleges and at universities. In this perspective, these authors stress the importance of academic guidance and entitle this as a "neglected dimension". But there is hardly empirical evidence of the effectiveness of assistance programs on retention rates. In connection to this, Curby (1984, p.5-6) gives an overview of the limited amount of available studies. Although the results of the research seem to be inconsistent, some of the studies clearly indicate the differential impact of the assistance programs with low-level or high-level students.

### 7.2.1 The communication dimension

As said before dropout is a growing field of concern in high school contexts[47]. Besides research focuses especially on the description and the explanation for causes of dropout, the search for effective solutions cannot wait. Rumberger mentions among his propositions for effective interventions : "an appropriate mix of educational and noneducational services in each program". This author explicitely refers to a variety of support functions (cognitive and non-cognitive) which must be presented.
When discussing the interrelation between support and persistence in O.L.S. settings, we mentioned in particular the theoretical approach of Tinto (1975), a theoretical approach developed for non-O.L.S. settings. Two elements in his model are of importance for the actual discussion : persistence is considered to be an outcome of a student's academic and social integration. These two elements are of importance when looking at the communication dimension of support. In literature, again the communication between student and tutor is considered to be of main importance :

#### The impact of student-tutor communication

Above, we already discussed the research overview of Pascarella (1980). She could conclude that informal contact between students and faculty members could be effective. One of the - significant - effects is in relation to college persistence. But again, the author warns that this interrelation varies for different kinds of students. Contact seems important influencing the persistence of students with entering characteristics and levels of academic and social integration in an institution typically predictive of withdrawal (ibid, p.565).
Titley & Titley (1982, p.46-47) report on the positive impact of summer orientation programs as a specific approach to academic advising. This program incorporates e.g. clear information about career choices and career developments.
The two studies of Curby (1984, p.7-15) have been mentionned before. Analysis of the overall campus figures verifies an enhanced retention rate for program users.

[47] Cf. the research reviews of Rumberger (1987) and McDill, Natriello & Pallas (1985).

# 8. Integrating the theoretical and empirical findings : conclusions

When reviewing the research literature in relation to support, we discern that especially specific support dimensions, support functions and support effects have been researched. The following conclusions can be derived of this research body :

In general, course developers will need a new brand of consumer psychology - a psychology of distance learning dealing, inter alia, with how distance learners use, process, and react to instructional materials, taking into account the importance of both student and course characteristics.
It is striking that the subpopulation participating in support initiatives does not include those who actually are in need of support. This implies that future research has to focus on strategies to detect and involve those actually in need of real support. Moreover, several investigations suggest that students do not always use support in the way it is intended. More research is needed focusing on the actual use of the materials by the students, which implies that the heterogeneity of the student population is to be taken into account.
Among the research findings, we recapitulate especially the following :
Study centre attendence seems not to be relevant. Student opinions reflect that this type of support provisions serve other support functions.
Although drop-out is a serious problem during the first part of courses, giving information in study centres is not an effective strategy to prevent drop-out.
Study time management seems to have a facilitative effect.
There is a vast amount of research in relation to teleconferencing, hypermedia etc. but the amount of controlled research procedures remains rather restricted. This is in sharp contrast with the research in relation to the more traditional applications of educational media, based on the use of the written word.
The latter research indicates that support on the communication dimension is of high importance, especially when focusing on O.L.Systems, since this type of education still largely depends on the written word as a communication channel. The impact of incorporating support into learning materials has been intensively evaluated in relation to a variety of support functions. These functions can be summarized with the term scaffolding.

* Advanced organizers have a facilitative effect on learning and retention. Moreover this positive impact is especially high with university students. However, this impact seems only effective if students really have a need for advanced organizers and do not yet possess relevant ideational scaffolding skills.
* The influence of additional assignments is significant for examination performance. Slow students tend to solve the assignments to a higher extent than drop-out students. All students rarely use - next to written courses - the extra study materials (videodisc, CDI, etc.). These findings are important in terms of time management. When course developers develop e.g. time-consuming support facilities this might result in not using them.
* Inserted questions in study materials are useful adjunct aids to learning.
* Overviews have a positive impact in the majority of studies.
* Pre-tests to support future learning have hardly been researched and are considered as access devices.
* Inserting questions and prequestions in materials have an acceptable value to generate a review process, to facilitate the learning process and to highten attention.
* Inserting objectives might have a negative effect on incidental learning. They are not used in the way foreseen but rather function as access devices instead of attention directors.
- Providing key concepts provokes thinking of students although this does not extend beyond the micro-level of the text.
* Different typographic presentations of written learning materials do not lead to different learning results.

The communication dimension also puts forward the importance of "contact". The social link between student and tutor is thus perceived as a catalyst of the study process. Only a limited amount of studies seem to detect significant effects. Most investigations reveal inconsistent research findings. The impact of informal student-tutor communication is not completely clear. It can be said that the impact varies for different kinds of students. The impact of formal student-tutor communication yields conflicting or non-supportive results. Nevertheless students with higher prior achievement benefit more than students with lower prior achievement from an increase of structural support. A possible explanation is that students think they would learn better from contact with other students. Therefore promoting contact in-between students could be more relevant because of better learning as a result of group interchange of ideas.
Research on telephone-tutoring reveals non-significant differences in completion rates. Telephone support only enhances social integration of the students. And this seems especially effective when the calls are student-initiated to attain a significant impact on study completion.
Research focusing on development of study skills reveals that the long term and transfer of the learning experiences are restricted. These programs are only effective if they are linked with a specific subject domain. Domain-oriented support includes a continuous illuminative and goal-based evaluation.
The latter introduces the role of assessment and evaluation in relation to support. A distinctive feature is the assessment of academic preparedness and referral. Assessment and evaluation also implies guidance at recurrent choice points. This means that assessment procedures are to be designed to be much more indicative of student progress. Assessment is seen as an appropriate basis for instructional guidance. This might be helpful to take student characteristics and differences into account. Recent findings explain that among student variables prior knowledge helps to explain the highest percentage of variance in study success. Evaluation of prior knowledge requirements is helpful to guide curricular and carreer choices of students with varying backgrounds.
Nevertheless, the role of student characteristics puts heavy demands on the flexibility of support initiatives to be able to cope with individual differences.

When integrating the support dimensions, the support functions and the support effects, we obtain table 5. This table summarizes the research findings in connection to the impact of specific approaches to support (a combination of support dimensions and functions) and the extent to which study success and/or study persistence is enhanced. Drawing the scheme was made arduous due to the fact that in most research, only the link between the support dimension and the support effect is made explicit. What type of support functions the specific approach does reflect, remains rather unclear. Based on the information available, we tried to make these functions explicit. This proved to be helpful to clarify the picture :

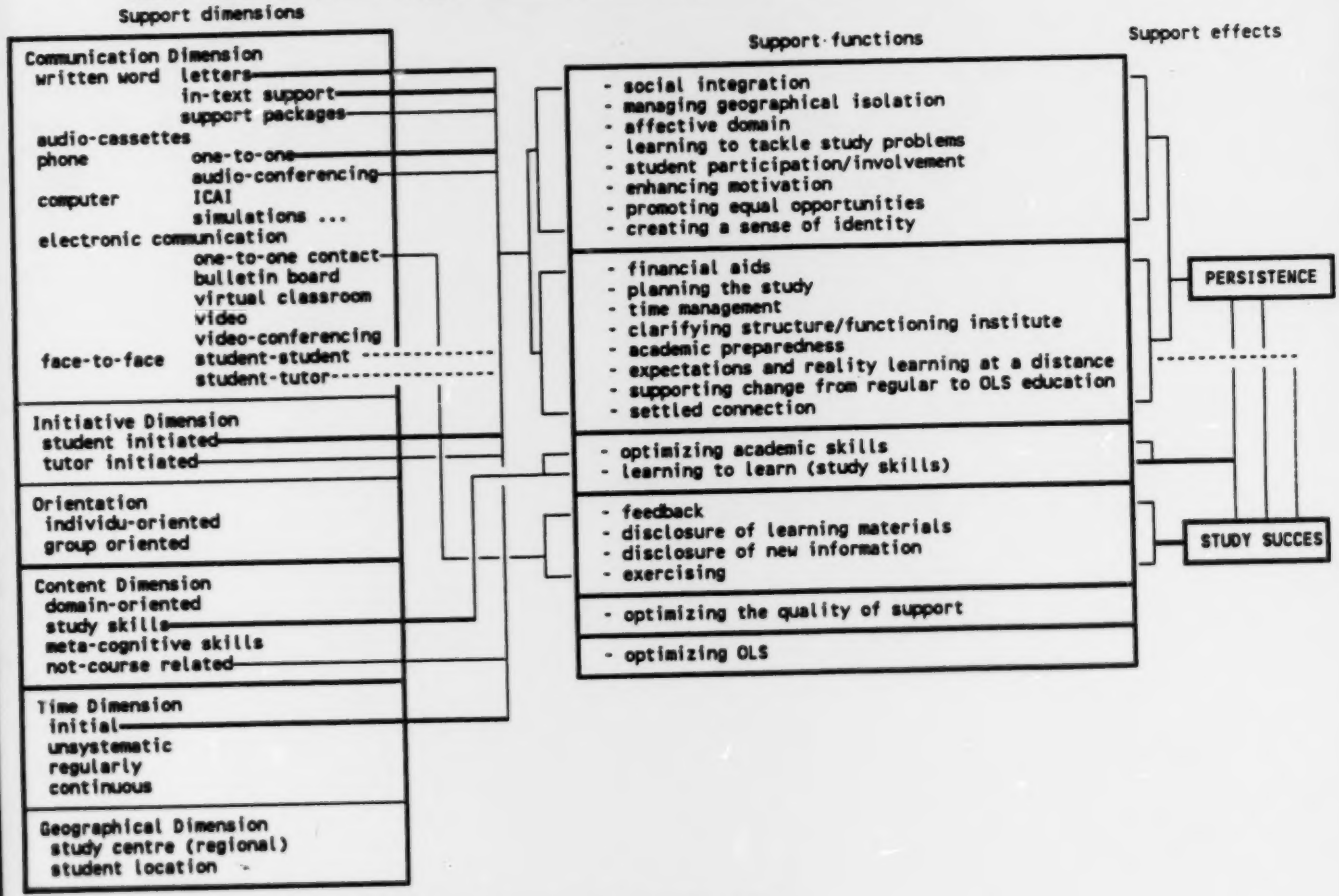
- In order to amplify study success, support initiatives serve especially academic functions.

The scheme represents only a slight interrelation between study skills or academic skills development and study success.

- In order to enhance study persistence, support initiatives serve especially non-academic functions (problem-centered or person-centered support).
- Problem-centered or person-centered support is to a large extent linked with study persistence. But research seems to support also the value of the academic functions of support in order to retain distance education students. This seems to confirm the hypothesis about the fact that being successful in a course -because of mastery of academic skills - predicts future success and therefore study persistence. This exhibits at the same instant the complex interrelation between both variables : persistence and study success.

The latter also suggests that it might be important to exploit support initiatives as fully as possible to serve as many functions as possible. But this conclusion might also be due to the unclarity in the research literature (unclarity of actual content and function of support initiatives).

Table 5 : The interrelation between support dimensions, functions of support and support effects




——— Interrelation between dimensions, functions and persistence
..... Interrelation between dimensions, functions and study success
═══ Interrelation between dimensions, functions and both support effects

In relation to the **dimensions**, we perceive the following :

The fact that some support dimensions in table 2 have not been dealt with in research does not imply that these are of minor importance.

At the one hand, most support research initiatives can also be classified along these dimensions but the projects do not reflect comparative research between the different alternatives along the dimensions. A typical example of the latter is the role of the study centres in providing the students with specific types of support. No experimental research attempts could be traced which analysed in detail this support technique or compared e.g. this approach with home-based support provisions. But this does not suggest that study centres are not valuable. On the other hand, there is also a lack of research. This is e.g. especially true when looking at the very promising new tools to develop communication network between those involved in O.L.Systems. But this is certainly also true for those support initiatives who demand face-to-face contact between a tutor and the student. Research evidence is highly needed to account for the high investment in hardware and/or manpower.

When focusing on the support **functions** :

We notice at the one hand that a large variety of support functions is put forward, but at the other hand that most research does not explicitely link a support approach to a particular support function when looking for certain support effects. The only exceptions are the research projects where the content focuses on study planning, time management and the development of study skills, revealing positive effects. A variety of support functions has - yet - not been researched or is researched in an implicit manner (e.g. student participation, creating equal opportunities, academic preparedness, optimizing quality of support, optimizing O.L.Systems, etc.).

In connection with the support **effects** :

We perceive that most research deals with the value of support at the micro-level, thus focusing on effects in terms of the student in O.L.Systems. The scheme clearly indicated that providing support does make a difference and can have a positive impact.

No research projects could be traced that focus on the quality-control aspect of support.

The actual research overview puts forward guidelines for future research. In our opinion, it is possible to present a priority list. There is e.g. a high need for research aiming at :

1. clarifying the impact of in-text embedded support (advance organizers, overviews, questions, assessment, pretests, etc.);
2. the development of assessment procedures to direct student support;
3. the identification of those students who are in need of support
4. the investigation of how students do use support facilities (in relation to the intentions of the support developers)
5. the validation of the impact of technology-delivered communication;
6. the validation of the investment in face-to-face communication (including study centres).

In setting up new research, the actual overview also highlights the importance of determining what actually happens during a support session or initiative. This can be helpful to define to a more detailed degree what specific function a support attempt serves and how this is related to specific support effects.

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